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COMMITTEE ON THE PEACEFUL
USES OF OUTER SPACE

IMPLEMENTATION OF THE RECOMMENDATIONS OF THE SECOND UNITED NATIONS CONFERENCE ON THE EXPLORATION AND PEACEFUL USES OF OUTER SPACE

International cooperation in the peaceful uses of outer space: programmes of international organizations

Note by the Secretariat

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INTRODUCTION

1. The Working Group of the Whole to Evaluate the Implementation of the Recommendations of the Second United Nations Conference on the Exploration and the Peaceful Uses of Outer Space, in the report of its eighth session (A/AC.105/571, annex II), made recommendations concerning the preparation of reports and studies by the Secretariat and the compilation of information from Member States and international organizations.

2. In particular, the Working Group recommended that, in the light of the continued development of space activities, the Committee on the Peaceful Uses of Outer Space should request international organizations with space-related activities to continue to inform the Secretary-General annually concerning those space activities that were or could be the subject of greater international cooperation, with particular emphasis on the needs of developing countries (A/AC.105/571, annex II, para. 11).

3. The report of the Working Group was adopted by the Scientific and Technical Subcommittee at its thirty-first session (A/AC.105/571, para. 22), and the recommendations of the Working Group were endorsed by the Committee on the Peaceful Uses of Outer Space at its thirty-seventh session.[1]

4. The United Nations Office for Outer Space Affairs subsequently addressed a letter dated 13 July 1994 to all international organizations with space-related activities requesting them to communicate their activities to the Office by 30 November 1994.

5. The present document was prepared by the Secretariat on the basis of information received by 31 December 1994. Information received subsequent to that date will be included in addenda to the present document.

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[1] Official Records of the General Assembly, Forty-ninth Session, Supplement No. 20 (A/49/20), para. 29.

REPLIES RECEIVED FROM INTERGOVERNMENTAL AND INTERNATIONAL ORGANIZATIONS

UNITED NATIONS EDUCATIONAL, SCIENTIFIC AND CULTURAL ORGANIZATION

The United Nations Educational, Scientific and Cultural Organization (UNESCO) uses remote sensing and geographic information systems (GIS) in the implementation of international programmes related to environmental problems, management of natural resources, study of natural hazards, protection of historical monuments and preservation of the natural and cultural heritage.

1. Oceanography and marine sciences

The Intergovernmental Oceanographic Commission (IOC) of UNESCO participates actively in the World Climate Research Programme and in the International Geosphere-Biosphere Research Programme (IGBP), in cooperation with the United Nations Environment Programme (UNEP), World Meteorological Organization (WMO) and the International Council of Scientific Unions (ICSU), which aims to improve the understanding of the role of the oceans in global climate change. The Tropical Ocean and Global Atmosphere (TOGA) experiment uses satellite surface temperature measurements (SST) to study the interaction and fluxes between tropical oceans and the global atmosphere, whereas in the World Ocean Circulation Experiment (WOCE), satellite sea surface topographic measurements, in addition to SST, are indispensable.

With the same partners, the Global Ocean Observing System (GOOS) is under development. GOOS is an integrated ocean information/management system of data on major physical, chemical and biological properties of the ocean, collected by satellite-borne and on-site instruments. The first component of GOOS is the climate assessment module which consists of the validation of satellite data and its assimilation into ocean-atmosphere models. Modules on the health of the oceans, living marine resources, the coastal zone and marine meteorological and oceanographic services will soon be developed.

Additional uses of remote sensing and GIS applications in oceanography and marine sciences:

- Optimize coordination of shipping routes
- Monitor ice sheets hampering sea transport
- Map ocean surface temperatures
- Map wind fields, wave heights, wave directions and ocean currents
- Assess net primary productivity
- Conduct strategic planning to mitigate sea and ocean pollution
- Manage effectively coastal resources.

2. Ecology

Since 1976, a worldwide network of biosphere reserves has been under development by UNESCO, in the framework of the Man and the Biosphere (MAB) programme. By January 1994, there were 324 biosphere reserves in 82 countries which cover about 2.1 million km^2 of terrestrial and coastal areas and encompass two thirds of the 193 biogeographical provinces of the terrestrial world.

The biosphere reserves provide in situ protection to genetic resources and ecosystems, maintain biodiversity, act as sites for long-term ecological research and monitoring, and harmonize conservation with local development. To demonstrate the multifunctions of biosphere reserves, three pilot studies are being carried out in cooperation with the International Institute for Aerospace Survey and Earth Sciences (ITC,

Netherlands) using GIS. They are being undertaken in the Amboseli Biosphere Reserve in Kenya for the sustainable management of tropical savanna ecosystems and wildlife conservation; in the Cibodas Biosphere Reserve in Indonesia for the conservation management and planning of humid tropical forest ecosystems; and in the Wuyishan Biosphere Reserve in China for zoning analysis and buffer zone development issues in subtropical mountain forest. The ILWIS system of ITC is being used in these studies, as well as Arc/Info. Satellite images are one of the data sources of these projects.

The international biosphere reserve network has a potential and important role to play in the study of global change, particularly concerning the effects of climate change on landcover and biodiversity. UNESCO presently cooperates with the Food and Agriculture Organization of the United Nations, International Council of Scientific Unions, UNEP and WMO in the development of the Global Terrestrial Observing System (GTOS), a network to detect and monitor changes in terrestrial ecosystems. At present, guidelines concerning the selection of regions for monitoring world ecosystems are being set up; methods to combine intensive and extensive measurements with remote sensing are being determined; and parameters for monitoring from space and on Earth to detect the motors of environmental change are being selected. A joint GTOS Task Force is being organized with support from the Swiss Federal Institute for Forest, Snow and Landscape Research. (A report on GTOS is included in the 1993 issue of the MAB Digest Series.)

It is also expected that the biosphere reserves will form an integral part of a wide spectrum of complementary and transversal scale observations from man-on-the-ground to satellite platforms and contribute to space data interpretation and validation as well as calibration of satellite instruments and measurements. In this respect, UNESCO encourages space agencies and industries to work in biosphere reserves and develop them into terrestrial platforms as a complementary instrument to space observation systems.

3. Hydrology

The International Hydrological Programme (IHP) promotes the use of GIS technique in hydrological and water resources studies. The programme aims to keep the water community informed on possible uses and the latest developments of GIS in hydrological studies and encourages cooperation among different national systems through the exchange of experiences in setting up water information systems and establishment of a network of cooperating institutions.

A number of pilot projects are implemented to demonstrate the usefulness of GIS and remote sensing in optimizing groundwater and surface water management in the humid tropics and semi-arid zones, especially in developing countries. Four of these projects are carried out in cooperation with ITC Netherlands concerning:

- Water quality assessment of a lagoon (Thailand)
- Water resources assessment for the production of a district water plan (Kenya)
- Groundwater system study in a semi-arid ecosystem (Kenya)
- Water resources management in a biosphere reserve (Indonesia).

In Latin America and the Caribbean, a project on hydrological cycles and water resources activities observation and information system (LACHYCOS) is being conducted using GIS.

Concerning the transfer of knowledge, IHP organizes conferences and produces computer-assisted demonstration packages and guidance materials. The first international conference on GIS entitled "Application of Geographic Information Systems in Hydrology and Water Resources Management" was held in Vienna in 1993, and a second conference will be held in the same city in 1996.

A demonstration package on data integration and analysis using GIS for modelling water resources and water demand in semi-arid areas was published in 1994, as well as a book entitled Introduction to the Use of GIS for Practical Hydrology. The book introduces the readers to the use of GIS in the analysis of water resources for water development projects and watershed management. Basic principles are explained together with practical applications.

4. Earth sciences

The Division of Earth Sciences of UNESCO implements activities in the framework of the Geological Applications of Remote Sensing (GARS) programme for socio-economic development and for the mitigation of the effects of natural disasters.

A GARS project was implemented in Africa to upgrade geological maps for better exploration, exploitation and management of natural resources. The second phase of the project concerns database management (DBM), which aims to strengthen databases of geological surveys for GIS application for the better management of natural resources.

In the framework of the International Decade for Natural Disaster Reduction (1990-1999), UNESCO implements research projects to study natural hazards of geological origin with a view to reducing the loss of life and material damages. The objective of the GARS project in Latin America is to develop a methodology for cost-effective mapping and monitoring of landslide in the Andean region. Socio-economic geological and geophysical data are integrated with airborne and space-borne remote sensing data for GIS for the preparation of accurate risk maps.

A similar study will be implemented in Asia in 1995 using optical remote sensing and synthetic aperture radar data in the analysis of volcanic hazards and its associated debris flows (i.e. lahars).

UNESCO has published several series of the "Environment and development" Brief in line with the Agenda 21 recommendation of the United Nations Conference on Environment and Development (Rio de Janeiro, 1992) on how to deal with environmental problems. Brief No. 3 summarizes the importance of remote sensing and GIS technologies in confronting such problems.

5. Culture

In the framework of the UNESCO programme "Integral study of silk roads: roads of dialogue", projects are being developed for the preservation and protection of historical monuments and sites. Cooperation has been established with space agencies such as the Centre National d'Etudes Spatiales of France, National Aeronautical and Space Administration (NASA) of the United States of America and National Space Development Agency (NASDA) of Japan for the release of satellite images for the production of a general map of the silk roads and for the study of archaeological sites along the silk roads (e.g. Merv, Turkmenistan; Palmyra, Syrian Arab Republic; Saklamakan Desert, China) and to preserve historical sites, e.g. Moenjodaro, Pakistan.

6. Training programmes

As remote sensing and GIS are considered complex technologies which require trained personnel for their effective exploitation, UNESCO organizes annually in cooperation with scientific institutes, non-governmental organizations and United Nations bodies, postgraduate courses in remote sensing related to geology, hydrology, ecology and marine sciences. Short ad hoc courses, workshops and seminars are also held in developing countries to strengthen indigenous capacity. Currently, cooperation with space agencies

is being developed for the preparation of training workshops on the use of radar imagery for the management of natural resources.

7. Computer-based learning modules

During the last five years UNESCO has produced computer-based learning (CBL) modules on marine applications of satellite and remote sensing, in the framework of the Training and Education in Marine Science (TREDMAR) programme. These modules are distributed worldwide and users are invited to contribute to the development of new lesson materials in order to create an international remote sensing marine and coastal education network. At present, the "global faculty" consists of users from 500 universities, government services and companies in 77 countries who use the modules for teaching and continuing educational purposes, and as a research tool. The fifth CBL "Applications of marine and coastal image data" from satellite airborne and in situ sensors will be released in 1994 and the sixth module planned for 1995 will contain the first lessons using the new Windows version of Bilko, a UNESCO image-processing software. Similar modules and demonstration packages will be produced in the fields of ecology, hydrology and geology in the near future.

Conclusion

Further use of remote sensing and GIS technologies in UNESCO programmes will depend on:

- Exchange of data and equipment in space science and technology
- Transfer of technology and exchange of experts
- Access to remote sensing data, ground receiving systems and digital image processing
- Human resource development in developing countries.

EUROPEAN SPACE AGENCY

The European remote sensing satellite (ERS-1) of the European Space Agency (ESA) is a global remote sensing mission and therefore is suitable for access and use by developing countries. ESA has also developed expertise in distance education, thin route telephony data communications, data collection and database access which could be adapted for use in developing countries. In addition, experiments being carried out presently with communication satellites in the Russian Federation could be adapted to serve the needs of developing countries.

In space science, ESA is able to offer archived data from a selection of scientific missions and additionally provide experts to give training in the above-mentioned fields.

There is currently an ad hoc working group in ESA which is looking into the possibilities of the usefulness of data from ESA satellites for developing countries. A copy of its report will be made available in due time.